Journal Homepage: -www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI: 10.21474/IJAR01/21638
DOI URL: http://dx.doi.org/10.21474/IJAR01/21638

RESEARCH ARTICLE

THE EMERGING FACE OF CHILDHOOD CANCER IN MOROCCO: EPIDEMIOLOGICAL OVERVIEW OF A FIVE-YEAR COHORT IN RABAT.

Denise Edith Tatiana Ngbwa[13], Carine Wandaogo[13], Yassine Rakii[13], Omar Robleh[13], Falone Amoussou[23], Hubert Nikiema[13], Karima Nouni[13], Amine Lachgar[13], Hanan Elkacemi[13], Tayeb Kebdani[13] and Khalid Hassouni[13]

1. Department of Radiotherapy, National Institute of Oncology of Rabat, Morocco.
2. Department of Medical Oncology, National Institute of Oncology of Rabat, Morocco.
3. Faculty of Medicine and Pharmacy, Mohammed V University of Rabat, Morocco.

Manuscript Info

Manuscript History
Received: 18 June 2025
Final Accepted: 20 July 2025
Published: August 2025

Key words:
Pediatric cancer, Epidemiology, Morocco, Central nervous system tumors, Malignant tumors, Retrospective study, Survival rate, Treatment modalities.

Abstract

Childhood cancer represents a major public health challenge,particularly in low- and middle-income countries. This retrospective study aims to describe the epidemiological and clinical characteristics of pediatric malignant tumors at a national referral center in Morocco. We analyzed the records of 273 children (≤ 18 years)diagnosed and treated at the National Institute of Oncology (INO) in Rabat between 2020 and 2024. Out of a total of 7,691 registered cancer cases, pediatric cases accounted for 3.55%. A clear male predominance was observed (male-to-female ratio of 1.48), with a median age at diagnosis of 12 years. The analysis reveals a constant increase in the number of cases over the period, with an average annual growth rate of 30.6%. The cancer profile is dominated by central nervous system (CNS) tumors, followed by malignant blood cancers and renal tumors. Management was predominantly multimodal, and the overall 5-year survival is estimated at 95%. These data, among the first of their kind in Morocco, provide a crucial basis for developing targeted public health strategies and planning future national studies.

Introduction:

Cancer is the leading cause of death by disease among children and adolescents in many parts of the world. While survival rates have increased significantly, exceeding 80% in high-income countries, this success is far from universal [1]. It is estimated that more than 80% of pediatric cancers occur in low- and middle-income countries (LMICs), where survival rates are tragically lower, often below 40% due to limited access to early diagnosis, specialized treatments, and supportive care [1, 2]. In this context, studying the epidemiology of childhood cancer is essential to understanding the disease burden and guiding health policies.

In Morocco, like in many developing countries, robust epidemiological data on pediatric cancer are scarce due to the lack of national population-based registries [3, 4]. Existing information is mainly based on single-center studies or

Corresponding Author:-Denise Edith Tatiana Ngbwa
Address:-Department of Radiotherapy, National Institute of Oncology of Rabat, Morocco. 3.Faculty of Medicine and Pharmacy, Mohammed V University of Rabat, Morocco.

case series. The National Institute of Oncology (INO) in Rabat, as the largest cancer treatment center in Morocco, receives patients from various regions, offering a valuable insight into the country's epidemiological reality. This study aims to provide a detailed analysis of this cohort over a five-year period, to help establish a data baseline for future research and public health planning.

Objectives:-

The primary objective of this study is to comprehensively describe the epidemiological profile and the demographic and clinical characteristics of a large cohort of pediatric cancer patients treated at the INO in Rabat.

Secondary objectives include determining the relative incidence of childhood cancer compared to adult cases, analyzing the distribution by age and sex, identifying the most frequent tumor types, and evaluating the main treatment modalities and survival rates within this population over a five-year period.

Materials and methods:-

Study type and period:

This was a retrospective, descriptive, and single-center study conducted at the INO in Rabat. Data were collected over a five-year period, from January 1, 2020, to December 31, 2024.

Study Population And Data Collection:

The study population consisted of all patients aged 18 or younger who received a diagnosis of a malignant tumor and were treated at the INO. Data were extracted comprehensively from the institute's information system, ENOVA.

Inclusion And Exclusion Criteria :

- **Inclusion Criteria:**were patients aged 18 years or younger at the time of diagnosis who received a malignant tumor diagnosis confirmed by histopathological, cytological, biological, or morphological evidence.
- **Exclusion Criteria :** included cases of benign tumors, patients over 18 years old, and files for which key demographic or diagnostic information was missing or incomplete. In total, less than 10% of records were excluded due to missing data, which was handled by complete exclusion of the affected cases to ensure the reliability of the analyses.

For each patient, the following information was systematically collected: age at diagnosis, sex, histopathological diagnosis (based on histopathological, cytological, biological, and morphological evidence), tumor location, treatment modalities (surgery, chemotherapy, radiotherapy), vital status at last follow-up (deceased, alive), and date of last consultation or event occurrence. The data were anonymized and treated confidentially. The study was conducted after validation by the institution's scientific committee.

Statistical Analysis:

Data were analyzed using descriptive statistics. Qualitative variables are expressed as counts and percentages, while quantitative variables are presented as mean and range. The male-to-female ratio was calculated. To improve the robustness of the results, 95% confidence intervals (CI) were calculated for key percentages.

Although the study methodology is primarily descriptive, a time-trend analysis was performed to evaluate the evolution of the number of cases over the study period, including a linear regression slope calculation. Overall survival (OS) was estimated over the five-year study period.

Results:-

Cohort characteristics

During the five-year study period, 7,691 cancer cases were registered at the institute. Of this total, **273 cases** (3.55%; 95% CI: [3.2%-3.9%]) were in patients under 19 years of age. The cohort showed a clear male predominance, with 163 boys and 110 girls, for a male-to-female ratio of 1.48. The median age at diagnosis was 12 years, with a range of 2 to 18 years.

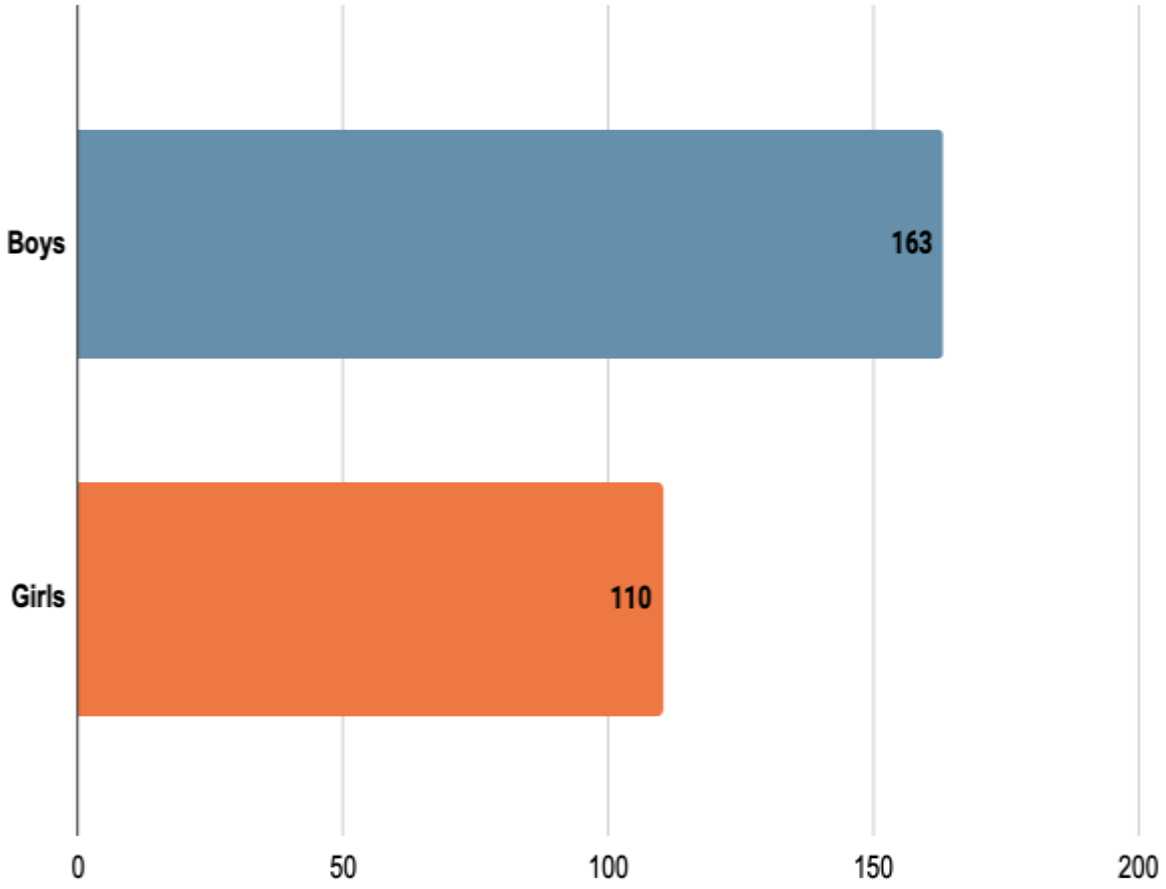

Figure 1: Distribution by sex.

Case trend over time:

The number of new pediatric cancer cases showed a progressive and sustained increase over the study period, with an average annual growth rate of **30.6%**. This trend is illustrated in Figure 2.

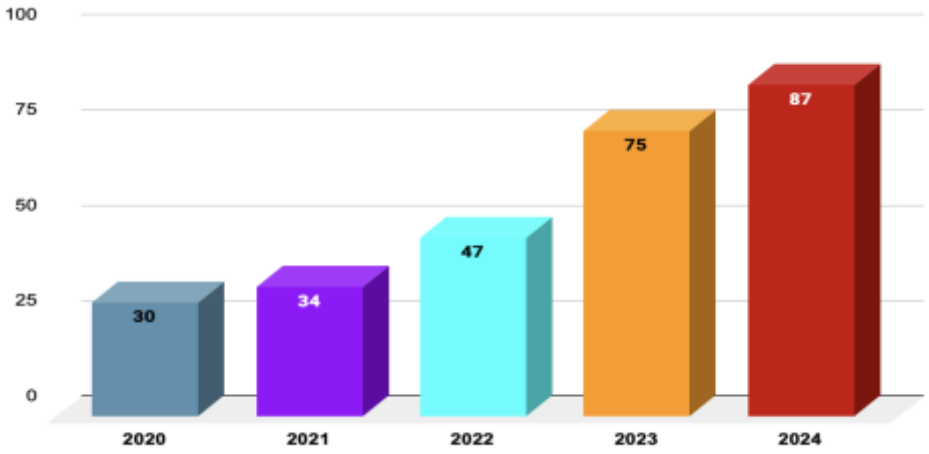

Figure 2: Distribution of childhood cancers by year.

Distribution by age and tumor types:

The age distribution showed that cancer significantly affects young children and adolescents, as shown in Figure 3. The most frequently affected ages were 6, 17, and 18 years (20 cases each). The age of 9 was the least represented (6 cases).

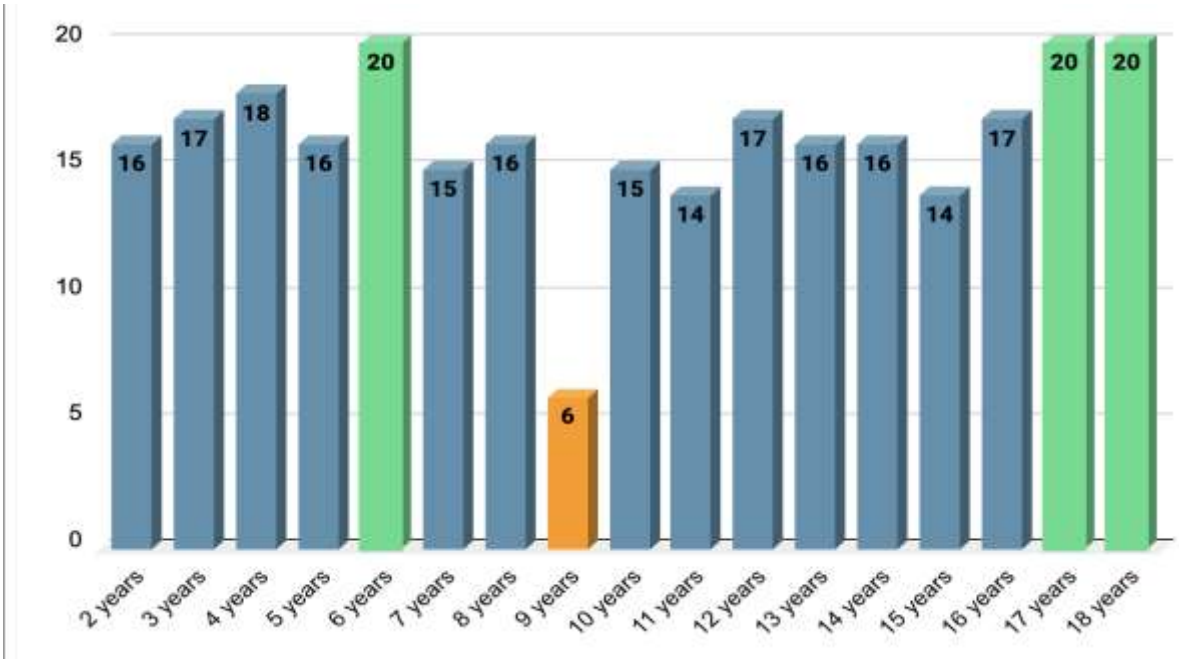

Figure 3:Distribution by age.

Regarding tumor types, the distribution across the entire cohort of 273 cases shows that the profile of pediatric cancers was dominated by central nervous system (CNS) tumors, followed by malignant blood cancers and renal tumors, as illustrated in Figure 4.

- **CNS tumors,** with **90 cases**, represented the most frequent category (33%; 95% CI: [28%-39%]). Within this category, medulloblastoma was the most common subtype, accounting for 79 cases.
- Malignant blood cancers ranked second with 38 cases (14%; 95% CI: [10%-18%]). Hodgkin's disease was the most prevalent subtype, with 28 cases.
- Renal tumors accounted for 31 cases (11%; 95% CI: [8%-15%]), including 13 cases of nephroblastoma.
- ENT tumors (27 cases, or 10%) were dominated by nasopharyngeal cancer (17 cases).
- Finally, bone tumors (20 cases, or 7%) were exclusively composed of osteosarcomas.
- Other types of cancers observed included bronchopulmonary cancers (19 cases), soft tissue neoplasms (17 cases), skin tumors (16 cases), digestive cancers (14 cases, including 10 cases of rectal cancer), and a single case of gynecological cancer (breast cancer).

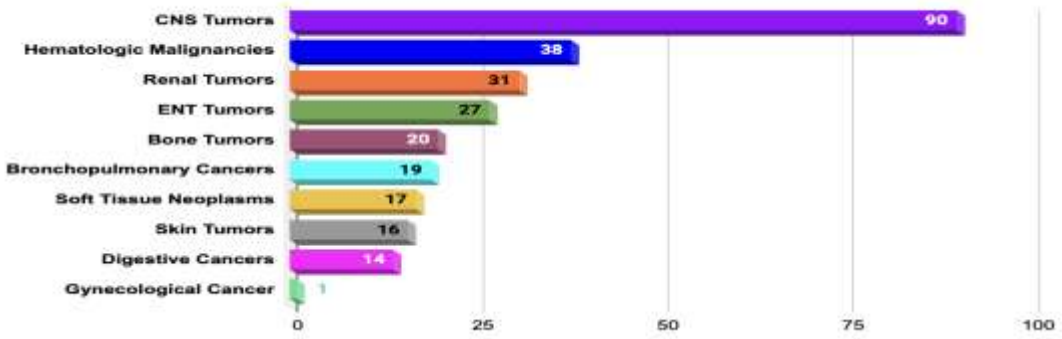

Figure 4: Distribution of different cancer locations.

Treatment modalities and survival:

Patients in this cohort benefited from a resolutely multidisciplinary care, with the treatment strategy defined during Multidisciplinary Team Meetings (MDTs). Surgical interventions were performed by specialized teams depending on the tumor's location: neurosurgeons for central nervous system tumors, urologists for renal tumors, ENT surgeons for cancers of the ear, nose, and throat area, as well as orthopedic surgeons and other surgical oncologists for bone and soft tissue tumors.

The Pediatric Hematology-Oncology Service (SHOP) of the Children's Hospital in Rabat was responsible for chemotherapy and overall medical management of the cases. Our service handled exclusively the radiotherapy component for cases that required it, thus solidifying our role as an essential link in this chain of care.
The overall 5-year survival rate is estimated at approximately **95%**, a result that, despite the retrospective nature of the data, testifies to the effectiveness of the care provided at the INO.

Discussion:-

Comparison with epidemiological data:

The results of our study confirm general observations made in international scientific literature, where childhood cancer represents a small proportion of all cancer cases. Our rate of 3.55% is comparable to that reported in many LMICs [5], although it is lower than WHO estimates, potentially reflecting under-diagnosis or referral bias. The observed male predominance (male-to-female ratio of 1.48) is a well-documented epidemiological phenomenon worldwide, particularly for brain tumors and leukemias [6, 7]. The median age at diagnosis of 12 years is also consistent with international trends [8].

The predominance of central nervous system (CNS) tumors (33% of cases) in our cohort is a major point of interest. In contrast to the International Classification of Childhood Cancer (ICCC), which places leukemias as the most frequent tumors globally (approximately 25-30%), followed by CNS tumors (20-25%) [9], our series presents an inverted profile.

This specificity distinguishes our cohort from most European and Asian series, where malignant blood cancers are systematically at the forefront. It also differs from some African series, such as those from Nigeria or Tanzania, where Burkitt lymphoma is often predominant [11, 12]. The predominance of medulloblastoma in our cohort could be a reflection of local etiological factors or specificities in the diagnostic system that favor the detection of this type of tumor.

Interpretation Of The Upward Trend and Potential Factors:

The constant increase in the number of cases over the study period is a notable result. It is unlikely to reflect a true increase in the incidence of pediatric cancer. More plausibly, this trend is the result of improved public and healthcare professional awareness, better diagnostic capacity in peripheral facilities, and improved patient referral mechanisms to specialized centers like the INO [12]. This suggests that more cases are being identified and treated, which is a positive indicator of the strengthening of the pediatric oncology healthcare system in Morocco.

Although our study cannot determine the causes, several hypotheses can be raised regarding the specificity of the observed tumors. Genetic factors (predispositions), specific environmental exposures (toxins, pesticides), or particularities in the healthcare system (such as diagnostic delays that could favor the detection of slower-growing, clinically manifest tumors) could play a role. The lack of data on socioeconomic factors or access to care does not allow for the confirmation of these hypotheses, but it underscores the importance of future research.

Treatment and Survival: A Crucial Comparison:

The adoption of multimodal treatments, including surgery, chemotherapy, and radiotherapy, demonstrates the quality of care provided at the INO, which aligns with international standard protocols. The use of radiotherapy in nearly all CNS tumor cases reflects the center's expertise in managing these complex pathologies.

The estimated overall 5-year survival rate of 95% is a particularly encouraging result. It should be interpreted with caution due to the limitations of the estimation, particularly the high proportion of patients lost to follow-up [13]. However, this figure is significantly higher than the survival rates often reported in LMICs, where they generally range from 20% to 50% [14]. It is also comparable to, or even higher than, the survival rates observed in high-income countries, which often exceed 80% and can reach 90% for certain subtypes [15].

This result, though approximate, suggests that the care provided at this referral center is effective and approaches the standards of high-income countries. It is all the more significant as it is achieved in a context where challenges related to infrastructure and logistics are substantial.

Study Strengths and Limitations:
The main strength of this study is that it provides epidemiological and clinical data on a large cohort within a country where such information is rare. It serves as a baseline for future national studies and allowed for the evaluation of not only epidemiology but also treatment modalities and a survival rate estimation.

However, as a single-center and retrospective study, it has inherent limitations that must be clearly acknowledged. The data cannot be generalized to the entire Moroccan territory due to a potential referral bias. The retrospective nature limited access to some detailed information, and the survival data are based on an estimation.

Conclusion:-

This study has provided an essential epidemiological overview of pediatric cancer within a major referral center in Morocco. The key findings, including the male predominance, the upward annual trend in the number of cases, and the distinct tumor profile dominated by CNS cancers, confirm observations made in similar contexts. The analysis of treatment modalities and the survival rate estimation reinforce the conclusion of high-quality care and testify to the progress made in the field.

This data serves as a crucial starting point for public health policies, advocating for better resource allocation, the training of specialized personnel, and the development of adapted care protocols. It highlights the urgent need to create a national pediatric cancer registry for a more complete understanding of the disease's incidence and distribution across the country and to measure progress in survival.

References:-

[1]WHO. Global Initiative for Childhood Cancer. (2024).
[2] WHO. Childhood cancer: key facts. (2024).
[3] El Rhazi, M. et al. Cancer incidence in Morocco: a population-based cancer registry. Asian Pacific Journal of Cancer Prevention (2013).
[4] Mokhtari M. et al. Epidemiology of childhood cancers in Morocco: a retrospective review of hospital records. Pan African Medical Journal (2020).
[5] K. M. A. Konaté et al. Épidémiologie des cancers de l'enfant dans un service d'oncologie pédiatrique à Bamako, Mali. Bulletin du Cancer (2018).
[6] Smith, M.A. et al. Cancer incidence and survival among children and adolescents: United States SEER Program, 1975-1995. (1999).
[7] Puumala, S.E. et al. Global patterns of childhood cancer incidence and mortality. Pediatric Clinics of North America (2012).
[8] Gatta, G. et al. Cancer survival in children and adolescents in Europe: a population-based study. The Lancet Oncology (2014).
[9] Steliarova-Foucher, E. et al. International Classification of Childhood Cancer, Third Edition. Cancer (2005).
[10] A. O. Atoyebi et al. Childhood cancers in Nigeria: a 10-year review. Annals of Oncology (2019).
[11] A. T. Mgaya et al. Cancer incidence in children aged 0-14 years in Dar es Salaam, Tanzania: a population-based study. Pediatric Blood & Cancer (2020).
[12] O. E. Ogu et al. Trends in pediatric cancer incidence and mortality in sub-Saharan Africa. Journal of Pediatric Hematology/Oncology (2021).
[13] A. M. Adamson et al. Challenges and opportunities for improving childhood cancer survival in low- and middle-income countries. Lancet (2022).
[14] F. C. M. A. Traore et al. Survival of children with cancer in Mali. Journal of Pediatric Hematology/Oncology (2020).
[15] P. Bleyer. The international effort to improve pediatric cancer survival in low and middle-income countries. Cancer (2016).